



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/800,610	03/15/2004	Gary L. Sugar	COG-2-0979.02.US	1801
24374	7590	11/28/2005	EXAMINER	
VOLPE AND KOENIG, P.C.			JACKSON, BLANE J	
DEPT. ICC			ART UNIT	
UNITED PLAZA, SUITE 1600			PAPER NUMBER	
30 SOUTH 17TH STREET			2685	
PHILADELPHIA, PA 19103			DATE MAILED: 11/28/2005	

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/800,610

Applicant(s)

SUGAR ET AL.

Examiner

Blane J. Jackson

Art Unit

2685

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☒ Claim(s) 4 and 5 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claims 4 and 5 are objected to because of the following informalities: both claims exhibit obvious claim dependency errors where it is expected that claims 4 and 5 are dependent on claim 1. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 are rejected under 35 U.S.C. 102(e) as being anticipated by Medvedev et al. (US 6,862,271).

As to claim 1, Medvedev teaches a method for wireless communication between a first communication device and a second communication device comprising:

At a first communication device;

Receiving a plurality of antennas signals transmitted by the second communication device (data transmission techniques for various multi-channel

communication systems including multiple-input multiple output (MIMO), column 2, lines 50-67),

Determining a receive weight vector comprising a plurality of complex receive antenna weights for the plurality of antennas of the first communication device from the received signals (MIMO system, column 4, lines 1-43),

Computing a transmit weight vector by computing a conjugate of the receive weight vector, the transmit weight vector comprising a complex transmit antenna weight for each of plurality of antennas of the first communication device wherein each complex transmit antenna weight has a magnitude and a phase whose values may vary with frequency across a bandwidth of the baseband signal (full CSI and eigenmodes of the MIMO channel, column 4, line 61 to column 5, line 23 and the beams steering scheme, column 11, lines 3-19) thereby generating a plurality of transmit signals each of which is weighted across the bandwidth of the baseband signal to be transmitted from corresponding ones of the plurality of antennas to the first communication device (beam steering transmission scheme, column 7, lines 48-12), wherein the magnitude of the complex transmit antenna weight associated with each antenna is such that the power to be output at each antenna is the same and is equal to the total power to be output by all of the plurality antennas divided by the number of antennas and such that the sum of the power at each corresponding frequency across the plurality of transmit signals is equal to a constant (column 7, lines 40-47 and column 10, line 32 to column 11, line 2) and

Applying the transmit weight vector to a baseband signal for transmission via the plurality of antennas of the first communication device to the second communication device (column 11, lines 14-19);

At the second communication device, receiving a plurality of antenna signals, determine a receive weight vector, compute and apply a transmit weight vector with respect to a first communication device of a MIMO system as discussed above for the first communication device.

As to claim 3, Medvedev teaches at each of the first and second communication devices are performed for each of K frequency sub-bands of the baseband signal that correspond to sub-carriers of a multi-carrier baseband signal or synthesized frequency sub-bands of a single carrier baseband signal (a MIMO channel with spatial sub-channels, column 4, lines 1-12 and column 6, lines 42-50).

As to claim 4, Medvedev teaches the method of claim 1 further comprising storing in the first communication device for each of the N antennas complex transmit antenna weights for a subset of the K frequency sub-bands or sub-carriers (data streams transmitted on the spatial subchannels require channel state information to describe the characteristics of the MIMO channel, column 4, lines 61-67).

As to claim 6, Medvedev teaches a method for wireless communication between a first communication device and a second communication device comprising:

At the first communication device, processing a baseband signal to be transmitted with transmit antenna weights to transmit beamform the corresponding signal via a plurality of antennas to the second communication subject to a constraint such that the power emitted by each of the antennas is the same (column 8, lines 4-12 and column 10, line 44 to column 11, line 19),

At the second communication device, the similar method as discussed above for a MIMO system (column 2, lines 13-50).

As to claim 7, Medvedev teaches the method of claim 6 wherein at the first communication device, receiving at the plurality antennas of the first communication device transmitted from the second communication device and deriving the transmit weights used by the first communication device to transmit to the second communication device based on the received signals and similar methods at the second communication device (column 11, lines 3-19).

As to claim 8, Medvedev teaches the method of claim 7 wherein at the first communication device, the step of deriving the transmit antenna weights comprises computing a conjugate of a receive weight vector derived from signals received at the first communication device from the second communication device and similar methods at the second communication device (column 4, line 1 to column 5, line 23).

As to claims 2 and 9 with respect to claims 1 and 7, Medvedev teaches the bandwidth of the baseband signal processed by each of the first and second communication devices comprises K plurality of frequency sub-bands and the magnitude of the complex transmit antenna weights associated with each of the plurality of antennas of the respective communication device is such that the power to be output by each antenna is the same and is equal to $1/KN$ of the total power to be output for all of the K frequency sub-bands where N is the number of antennas of the respective communication device (spatial subchannels of a MIMO or MIMO-OFDM system, column 2, lines 13-20 and column 6, lines 42-50 and allocated power to the data streams based on various transmission schemes including the beam-steering scheme, column 7, line 40 to column 8, line 12).

As to claim 10, Medvedev teaches the method of claim 7 wherein the first and second communication device repeating the step of deriving the transmit weights to update the transmit weights for transmitting back to the respective communication device (receiver reports the information to the transmitter in a transmission scheme in a multi-mode MIMO system to provide improved overall performance, column 2, lines 57-60 and column 4, line 61 to column 5, line 9).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Medvedev (US 6,862,271). Medvedev teaches subchannels using channel state information that is descriptive of the characteristics, amplitude and phase of the MIMO channel and that essentially retrieving a stored subset of these complex transmit antenna weights, column 4, line 61 to column 5, line 9, but does not specifically teach generating the complete set of antenna weights for all of the K frequency subbands or subcarriers using interpolation techniques. However, since Medvedev teaches general means to determine the subchannel transmit antenna weights, it would have been obvious to one skilled in the art at the time of the invention to alternatively use interpolation to educe computation time and reliance on a full CSI transmission scheme.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Medvedev et al. (US 2003/0157954) discloses power control for partial channel state information of MIMO systems. Gans et al. (US 5,854,611) discloses a radiotelephone system utilizing power sharing networks for linear power amplifiers to share an input signal with resulting equal power and beam forming at the

antennas. Ketchum (US 6,956,907) discloses power allocation in a MIMO communication system.

Further related patents assigned to Qualcomm Incorporated but are pre-dated by the application are Menon et al. (US 6,940,917) disclosing beam steering and beam forming for wideband MIMO/ MISO systems and Agrawal et al. (US 6,873,606) disclosing a rate adaptive transmission scheme for MIMO systems.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Blane J. Jackson whose telephone number is (571) 272-7890. The examiner can normally be reached on Monday through Friday, 8:00 AM-5:00 PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Urban can be reached on (571) 272-7899. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Application/Control Number: 10/800,610
Art Unit: 2685

Page 9

BJJ


FORWARDED TO: [illegible]
TECHNOLOGY CENTER 2000